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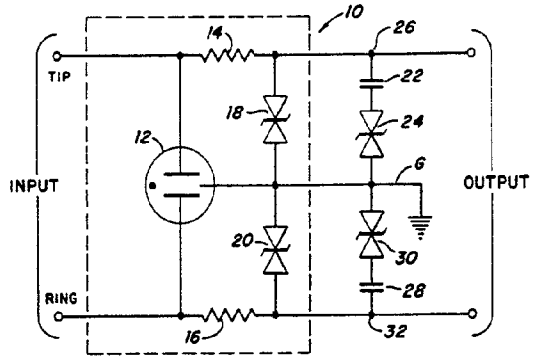
(54) Telephone and data overvoltage protection apparatus.

(57) Overvoltage protection circuits (10) are provided for coupling a subscriber's station to first and second conductors connected to a telephone system of other similar communication source. The overvoltage protection circuits (10) include first circuitry (12, 18, 20) connected between the first and second conductors for conducting current at a first breakdown voltage and for blocking current below the first breakdown voltage; second circuitry (24, 30) for conducting current at a second breakdown voltage and for blocking current below the second breakdown voltage; and circuitry (14, 22; 16, 28) connected in series between the first (12, 18, 20) and second (24, 30) circuitry for filtering voltage signals on the first and second conductors responsive to the second circuitry conducting current. The overvoltage protection circuits are effective for suppressing noise and transient voltage signals occurring above the data signal and do not require a transient voltage signal to exceed the ring signal for operation.

Fig.1



EP 0 338 107 A1

TELEPHONE AND DATA OVERVOLTAGE PROTECTION APPARATUS

This invention relates generally to an overvoltage protection circuit and apparatus for a pair of telephone lines and similar data communication channels and, more particularly, to circuitry for filtering noise and transient voltage signals above data signals on the lines or channels.

Various arrangements have been used for protecting telephone and communications equipment against hazardous voltages due to lightening or power surges. However, conventional arrangements are effective for clamping transient voltages at a rated potential selected above the ring signal of conventional communications systems. The typical ring signal is about 170 volts AC peak with a frequency between 15 and 30 hertz so that the conventional arrangements typically have a rated clamping voltage of approximately 200 volts. Consequently, such arrangements are ineffective for filtering noise and transient voltage signals occurring below this standard clamping voltage. Therefore the invention as claimed solves the problem of providing an overvoltage protection circuit or apparatus effective for suppressing or minimizing also noise and transient voltage signals occurring below a predefined potential such as that one of a ring signal supplied by the respective telephone or other communication system.

In accordance with preferred embodiments of the invention, there are provided overvoltage protection arrangements for coupling a subscriber's station to first and second conductors connected to a telephone system or other similar communications source. The overvoltage protection arrangements include first means connected between the first and second conductors for conducting current at a first breakdown voltage and for blocking current below said first breakdown voltage; second means for conducting current at a second breakdown voltage and for blocking current below said second breakdown voltage; and means connected in series between said first and second means for filtering voltage signals on said first and second conductors responsive to said second means conducting current.

In accordance with the invention, the overvoltage protection arrangements are effective for suppressing noise and transient voltage signals occurring above the data signal and do not require a transient voltage signal to exceed the ring signal for operation. In the following two specific embodiments of the invention will be described in detail in connection with the attached drawing in which:

FIGURE 1 is an electrical schematic representation of an overvoltage protection apparatus arranged in accordance with the principles of the present invention; and

FIGURE 2 is an electrical schematic representation of an alternative overvoltage protection apparatus arranged in accordance with the principles of the present invention.

Referring now to the FIGURE 1, there is illustrated an electrical schematic representation of an overvoltage protection circuit according to the invention generally designated by the reference numeral 10. The overvoltage protection circuit 10 is adapted for connection via TIP and RING conductors to a telephone system or other similar communications source at its INPUT. A subscriber's station, such as a key set, modem or private branch exchange is connected to the OUTPUT of the circuit 10. The overvoltage protection circuit 10 includes a gas discharge tube 12 or similar device that is connected between the TIP and RING conductors and to ground potential at ground line G. A resistor 14 is connected in series with the TIP line and a resistor 16 is connected in series with the RING line.

A transient voltage suppressor 18 is connected between the resistor 14 and ground potential and similarly a transient voltage suppressor 20 is connected between the resistor 16 and ground potential. The gas discharge tube 12 clamps transient voltages that appear both across the TIP and the RING conductors with respect to the ground line G and provides a high impedance to the ground line G when a high voltage transient is not present. A three electrode gas discharge tube device such as, a Milli-Triac part number MLT0090, rated for a breakdown voltage of 600 volts, manufactured by Reynolds Industries may be employed for the gas discharge tube 12. The transient voltage suppressors 18 and 20 conduct whenever the voltage potential applied to the TIP or RING lines, respectively, exceeds a predetermined breakdown voltage potential, for example, at 200 volts. The gas discharge tube 12, resistors 14 and 16 and the transient voltage suppressors 18 and 20 are enclosed in dotted lines in the accompanying figure and are effective for protecting the communications equipment from hazardous voltages due to lightening and power surges. Transient voltage suppressors of a type manufactured and sold by General Semiconductor Industries, Inc., a Square D Company under a registered trademark TransZorb, such as part number SCM170C rated for a reverse standoff voltage without conduction at 170 volts and for a

breakdown voltage in a range between 189-231 volts, advantageously may be employed for suppressors 18 and 20.

A capacitor 22 and a transient voltage suppressor 24 are connected in series between the ground line G and a junction 26 of the series connected resistor 14 and transient voltage suppressor 18. Similarly, a capacitor 28 and a transient voltage suppressor 30 are connected between the ground line G and a junction 32 of the series connected resistor 16 and transient voltage suppressor 20. Similar devices as used for the transient voltage suppressors 18 and 20 advantageously can be employed for the suppressors 24 and 30, except having a lower breakdown voltage rating, such as part number SCM5.0C with a breakdown voltage rating in a range between 6.4 - 7 volts or part number SCM10C with a breakdown voltage rating in a range between 11.1 - 13.6 volts. The transient voltage suppressors 24 and 30 are selected to have a breakdown voltage rating above a predefined potential of a data signal carried by the TIP and RING conductors, such as, for example, 5 volts or 10 volts.

In operation, the series connected resistor 14, capacitor 22 and transient voltage suppressor 24 suppress noise and transient voltage signals having a predefined threshold rate of change and that are above the breakdown potential of the suppressor 24. This predefined threshold rate of change or frequency response is determined by the component values of the resistor 14 and capacitor 22. For example, capacitors 22 and 28 may be provided in a range of 0.1 and 1 microfarad with resistors 14 and 16 selected in a range between 10 and 30 ohms. Otherwise, in normal operation data signals are unaffected by the frequency response of the filter comprised of resistor 14 and capacitor 22 with the suppressor 24 blocking current flow. Similarly, the resistor 16, capacitor 28 and transient voltage suppressor 30 clamp noise and transient voltage signals occurring on the RING line.

Referring now to FIGURE 2, there is shown an alternative embodiment of an overvoltage protection circuit according to the invention generally designated by the reference numberal 10'. The same reference numerals are used for similar components of FIGURE 1. The protection circuit 10' includes a star arrangement of unipolar transient voltage suppressors 34, 36 and 38. The transient voltage suppressors 34, 36 and 38 perform the same function as the bidirectional suppressors 24 and 30 as before described. Unipolar transient voltage suppressors are available from General Semiconductor Industries, Inc. also sold under the registered trademark TransZorb as device types SCM5.0A through SCM170A.

In both protection circuits 10 and 10', the gas discharge tube 12 can be omitted. In addition, both protection circuits can be provided without the bidirectional transient voltage suppressors 18 and 20. It should be understood that the gas discharge tube 12 and the suppressors 18 and 20 can be eliminated and the protection circuits 10 and 10' remain effective for suppressing noise and transient voltage signals above the data signal.

Although the present invention has been described in connection with details of the preferred embodiment, many alterations and modifications may be made without departing from the invention. Accordingly, it is intended that all such alterations and modifications be considered as within the spirit and scope of the invention as defined in the appended claims.

Claims

1. An overvoltage protection circuit for a pair of telephone lines and similar data communications channels comprising:
first voltage clamping means (12, 18, 20) for clamping voltage signals on said lines at a first predetermined voltage potential;
second voltage clamping means (24, 30; 34 - 38) for clamping voltage signals on said lines at a second predetermined voltage potential; and
filter means (e.g. 14, 22; 16, 28) responsive to said second voltage clamping means (24, 30; 34 - 38) for filtering said voltage signals above said second predetermined voltage potential.

2. An overvoltage protection circuit as recited in claim 1 wherein said first voltage clamping means (12, 18, 20) include a gas discharge tube (12).

3. An overvoltage protection circuit as recited in claim 2 further including a pair of bidirectional semiconductor transient voltage suppressor devices (18, 20) connected across said gas discharge tube (12).

4. An overvoltage protection circuit as recited in claim 1 wherein said first predetermined voltage potential is above a predefined potential of a ring signal carried by said lines.

5. An overvoltage protection circuit as recited in claim 1 wherein said second predetermined voltage potential is above voice and data signals carried by said lines.

6. An overvoltage protection circuit as recited in claim 1 wherein said second voltage clamping means include a pair of bidirectional semiconductor transient voltage suppressor devices (24, 30).

7. An overvoltage protection circuit as recited in claim 1 wherein said second voltage clamping means includes a star arrangement of three unipolar semiconductor transient voltage suppressor devices (34 - 38).

8. An overvoltage protection circuit as recited in claim 1 wherein said filter means (e.g. 14, 22; 16, 28) are effective for filtering said voltage signals above a predetermined frequency.

9. An overvoltage protection circuit as recited in claim 1 wherein said predetermined frequency is above a predefined ring signal frequency range.

10. An overvoltage protection circuit as recited in claim 1 wherein said filter means (e.g. 14, 22; 16, 28) include a resistor (14, 16) and capacitor (22, 28) connected in series between said first (12, 18, 20) and second voltage clamping means (24, 30; 34 - 38).

11. An overvoltage protection apparatus for coupling a subscriber station to first and second conductors connected to a telephone system or other similar communications source, said overvoltage protection apparatus comprising:

first means (12, 18, 20) connected between the first and second conductors for conducting current at a first breakdown voltage and for blocking current below said first breakdown voltage;

second means (24, 30; 34 - 38) for conducting current at a seoond breakdown voltage and for blocking current below said second breakdown voltage; and

means (e.g. 14, 22; 16, 28) connected in series between said first (12, 18, 20) and second means (24, 30; 34 - 38) for filtering voltage signals on said first and second conductors responsive to said second means conducting current.

Fig.1

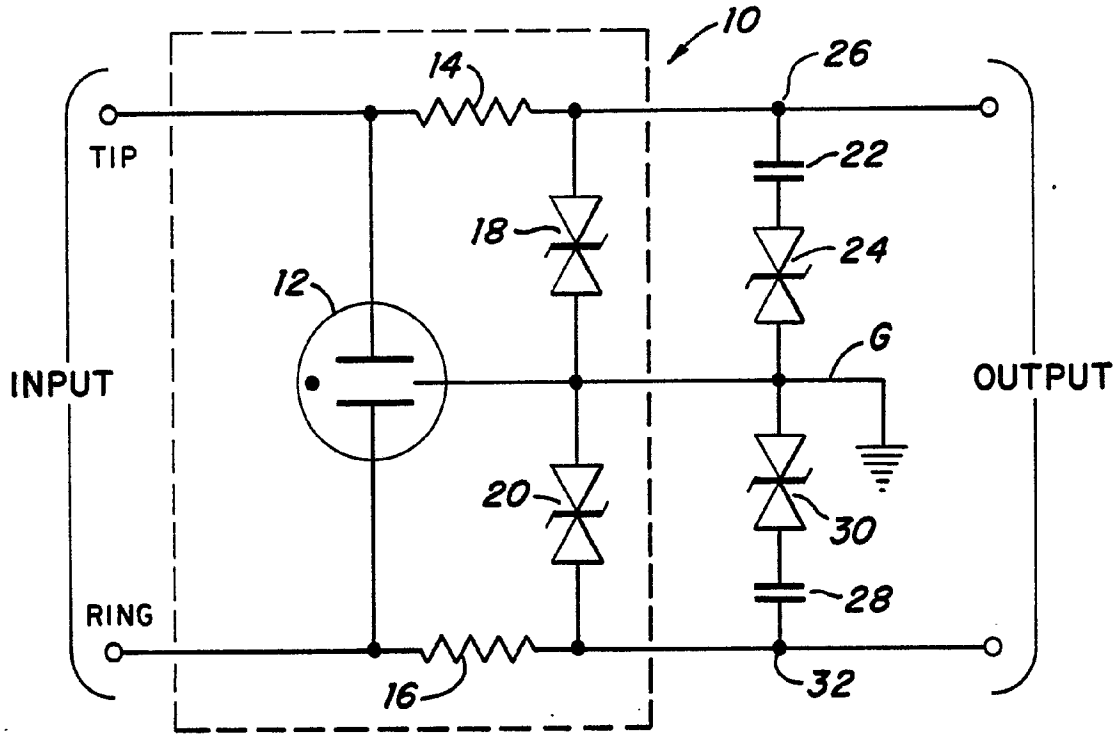
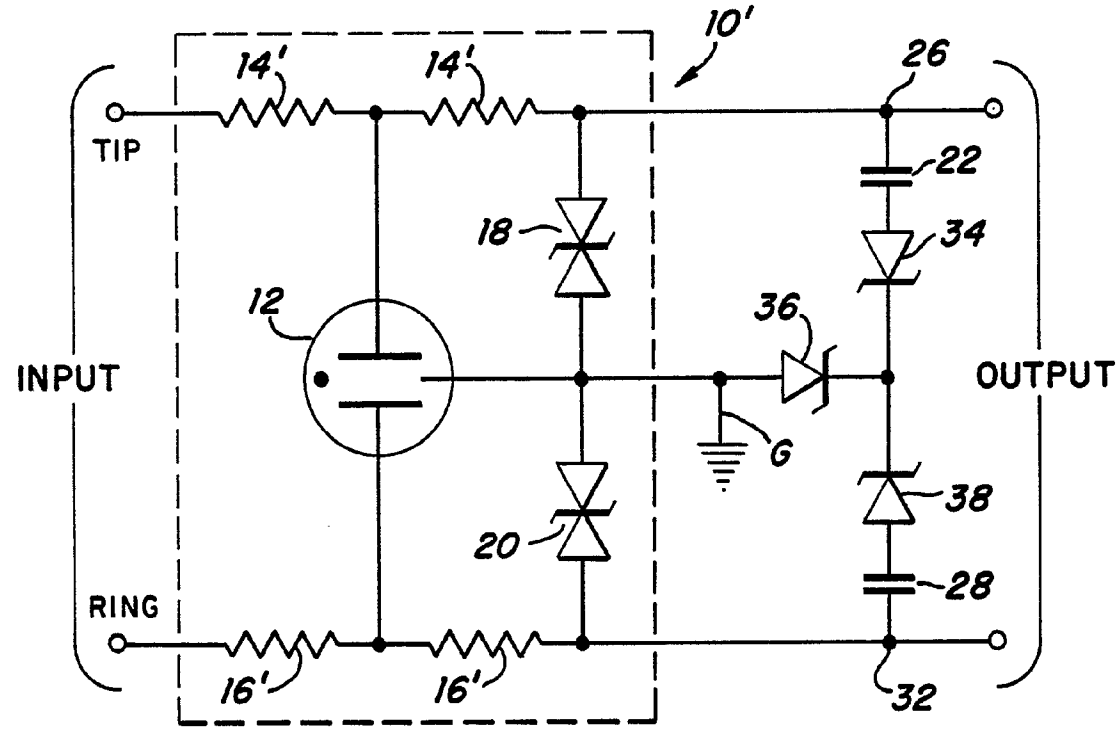

10
14
26
TIP
22
18
24
12
G
INPUT
OUTPUT
20
30
28
RING
16
32

Fig.2


10'
14'
14'
26
TIP
22
18
34
12
36
INPUT
OUTPUT
G
38
20
28
RING
16'
16'
32

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 10 6315

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	EP-A-0 186 873 (NIPPON TELEGRAPH AND TELEPHONE CORP.) * page 1, line 4 - page 3, line 12, figure 1 *	1-3,6, 11	H 02 H 9/04 H 04 M 3/18
A		4,5,7-10	
Y	DE-B-1 513 038 (SIEMENS AG) * claim 1; figure 2 *	1-3,6, 11	
A	US-A-4 586 104 (R.B. STANDLER) * abstract; figure 6 *	1-11	
A	DE-A-2 334 698 (KK SANKOSHA) * figures 1-4 *	1-11	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

H 02 H 9/04
H 04 M 3/18

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	13-12-1988	LEMMERICH J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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(54) **Overvoltage protection circuit used with a pair of telephone lines or similar data communication channels.**

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(56) References cited:
EP-A-0 186 873
DE-A-2 334 698
DE-B-1 513 038
US-A-4 586 104

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Courier Press, Leamington Spa, England.

Description

The invention relates to an overvoltage protection circuit as described in the pre-characterizing clause of claim 1.

An overvoltage protection circuit of this general kind is disclosed in DE-B-1 513 038 in a form where second voltage clamping means in combination with filter means consist of two oppositely poled diodes in series connection with a capacitor each. The capacitors are chargeable by the respective normal alternating voltage signal to be transmitted thereby lifting the threshold voltage of the diodes to a value suitable to reduce signal distortion by non-linearity of the diode characteristic.

However, whereas various arrangements have been used for protecting telephone and communications equipment against hazardous voltages due to lightening or power surges, conventional arrangements are effective for clamping transient voltages at a rated potential selected above the ring signal of conventional communications systems. The typical ring signal is about 170 volts AC peak with a frequency between 15 and 30 hertz so that the conventional arrangements typically have a rated clamping voltage of approximately 200 volts. Consequently, such arrangements are ineffective for filtering noise and transient voltage signals occurring below this standard clamping voltage.

The invention as claimed is intended to remedy this drawback by providing an overvoltage protection circuit effective for suppressing or minimizing also noise and transient voltage signals occurring below a predefined potential such as that one of a ring signal supplied by the respective telephone or other communication system.

The claimed selection of the breakdown voltage rating of the respective transient voltage suppressors results in that any noise and transient voltage signals below the standard clamping voltage of e.g. 200 volts can also be suppressed. In contrast to the circuit disclosed in the aforementioned reference DE-B-1 513 038 where the capacitors are charged continuously, current flow through the capacitors of the claimed filter means occurs only when the breakdown voltage of the second clamping means is exceeded, thus not to interfere with normal line signal transmission.

Advantageous further developments and dimensions in connection with the present invention are specified in the dependent claims. Concerning the claims 2 and 4, the use of voltage clamping means to suppress voltages exceeding the ring signal voltage and a star arrangement of three unipolar semiconductor transient voltage suppressor devices is, however, conventional as shown e.g. by EP-A2-0 186 873.

In the following two specific embodiments of the invention will be described in detail in connection with the attached drawing in which:

FIGURE 1 is an electrical schematic representation of an overvoltage protection apparatus arranged in accordance with the principles of the present invention; and

FIGURE 2 is an electrical schematic representation of an alternative overvoltage protection apparatus arranged in accordance with the principles of the present invention.

Referring now to the FIGURE 1, there is illustrated an electrical schematic representation of an overvoltage protection circuit according to the invention generally designated by the reference numeral 10. The overvoltage protection circuit 10 is adapted for connection via TIP and RING conductors to a telephone system or other similar communications source at its INPUT. A subscriber's station, such as a key set, modem or private branch exchange is connected to the OUTPUT of the circuit 10. The overvoltage protection circuit 10 includes a gas discharge tube 12 or similar device that is connected between the TIP and RING conductors and to ground potential at ground line G. A resistor 14 is connected in series with the TIP line and a resistor 16 is connected in series with the RING line.

A transient voltage suppressor 18 is connected between the resistor 14 and ground potential and similarly a transient voltage suppressor 20 is connected between the resistor 16 and ground potential. The gas discharge tube 12 clamps transient voltages that appear both across the TIP and the RING conductors with respect to the ground line G and provides a high impedance to the ground line G when a high voltage transient is not present. A three electrode gas discharge tube device such as, a Milli-Triac part number MLT0090, rated for a breakdown voltage of 600 volts, manufactured by Reynolds Industries may be employed for the gas discharge tube 12. The transient voltage suppressors 18 and 20 conduct whenever the voltage potential applied to the TIP or RING lines, respectively, exceeds a predetermined breakdown voltage potential, for example, at 200 volts. The gas discharge tube 12, resistors 14 and 16 and the transient voltage suppressors 18 and 20 are enclosed in dotted lines in the accompanying figure and are effective for protecting the communications equipment from hazardous voltages due to lightening and power surges. Transient voltage suppressors of a type manufactured and sold by General Semiconductor Industries, Inc., a Square D Company under a registered trademark TransZorb, such as part number SCM170C rated for a reverse stand-off voltage without conduction at 170 volts and for a breakdown voltage in a range between 189—231 volts, advantageously may be employed for suppressors 18 and 20.

A capacitor 22 and a transient voltage suppressor 24 are connected in series between the ground line G and a junction 26 of the series connected resistor 14 and transient voltage suppressor 18. Similarly, a capacitor 28 and a transient voltage suppressor 30 are connected between the ground line G and a junction 32 of the series connected resistor 16 and transient

voltage suppressor 20. Similar devices as used for the transient voltage suppressors 18 and 20 advantageously can be employed for the suppressors 24 and 30, except having a lower breakdown voltage rating, such as part number SCM5.0C with a breakdown voltage rating in a range between 6.4—7 volts or part number SCM10C with a breakdown voltage rating in a range between 11.1—13.6 volts. The transient voltage suppressors 24 and 30 are selected to have a breakdown voltage rating above a predefined potential of a data signal carried by the TIP and RING conductors, such as, for example, 5 volts or 10 volts.

In operation, the series connected resistor 14, capacitor 22 and transient voltage suppressor 24 suppress noise and transient voltage signals having a predefined threshold rate of change and that are above the breakdown potential of the suppressor 24. This predefined threshold rate of change or frequency response is determined by the component values of the resistor 14 and capacitor 22. For example, capacitors 22 and 28 may be provided in a range of 0.1 and 1 microfarad with resistors 14 and 16 selected in a range between 10 and 30 ohms. Otherwise, in normal operation data signals are unaffected by the frequency response of the filter comprised of resistor 14 and capacitor 22 with the suppressor 24 blocking current flow. Similarly, the resistor 16, capacitor 28 and transient voltage suppressor 30 clamp noise and transient voltage signals occurring on the RING line.

Referring now to FIGURE 2, there is shown an alternative embodiment of an overvoltage protection circuit according to the invention generally designated by the reference numeral 10'. The same reference numerals are used for similar components of FIGURE 1. The protection circuit 10' includes a star arrangement of unipolar transient voltage suppressors 34, 36 and 38. The transient voltage suppressors 34, 36 and 38 perform the same function as the bidirectional suppressors 24 and 30 as before described. Unipolar transient voltage suppressors are available from General Semiconductor Industries, Inc. also sold under the registered trademark TransZorb as device types SCM5.0A through SCM170A.

In both embodiments the suppressors 18 and 20 can also be eliminated if desired. In this case the protection circuits 10 and 10' remain, nevertheless, effective for suppressing noise and transient voltage signals above the data signal.

Although the present invention has been described in connection with details of the preferred embodiment, many alterations and modifications may be made without departing from the invention as defined in the appended claims.

Claims

1. An overvoltage protection circuit used with a pair of telephone lines or similar data communications channels and comprising:

first voltage clamping means (12) for clamping voltage signals on said lines at a first predetermined voltage potential;

second voltage clamping means (24, 30; 34 to 38) for clamping voltage signals on said lines at a second predetermined voltage potential; and

filter means (14, 22; 16, 28) responsive to said second voltage clamping means (24, 30; 34 to 38) for filtering noise or transient signals from said voltage signals only when said voltage signals exceed said second predetermined voltage potential,

said overvoltage protection circuit being characterized in that said second voltage clamping means (24, 30; 34 to 38) comprises a transient voltage suppressor (24, 30; 34 to 38) selected to have a breakdown voltage rating above voice and data signals carried by said lines and that said filter means (14, 22; 16, 28) includes a resistor (14, 16) and a capacitor (22, 28) connected in series between said first voltage clamping means (12) and said transient voltage suppressor (24, 30; 34 to 38).

2. The overvoltage protection circuit of claim 1 wherein said first voltage clamping means (12) clamps at a predetermined voltage potential above a predefined potential of a ring signal carried by said lines.

3. The overvoltage protection circuit of claim 1 or 2 wherein said second voltage clamping means (24, 30) includes a pair of bidirectional semiconductor transient voltage suppressor devices (24, 30).

4. The overvoltage protection circuit of claim 1 or 2 wherein said second voltage clamping means (34 to 38) includes a star arrangement of three unipolar semiconductor transient voltage suppressor devices (34 to 38).

5. The overvoltage protection circuit of any one of the preceding claims wherein said filter means (14, 22; 16, 28) is effective for filtering said voltage signals above a predetermined frequency.

6. The overvoltage protection circuit of claim 5 wherein said predetermined frequency is above a predefined ring signal frequency range.

7. The overvoltage protection circuit of any one of the preceding claims wherein said first voltage clamping means (12) is adapted for conducting current at a first breakdown voltage and for blocking current below said first breakdown voltage and said second voltage clamping means (24, 30; 34 to 38) is adapted for conducting current at a second breakdown voltage and for blocking current below said second breakdown voltage.

Patentansprüche

1. Überspannungsschutzschaltung in Verbindung mit einem Paar Telefonleitungen oder ähnlichen Datenübertragungskanälen und enthaltend:

erste Spannungsstabilisierungsmittel (12) zum Stabilisieren von Spannungssignalen auf diesen Leitungen bei einer ersten vorbestimmten Spannung;

zweite Spannungsstabilisierungsmittel (24, 30; 34 bis 38) zum Stabilisieren von Spannungssigna-

len auf den genannten Leitungen bei einer zweiten vorbestimmten Spannung und

durch die zweiten Spannungsstabilisierungsmittel (24, 30; 34 bis 38) gesteuerte Filtermittel (14, 22; 16, 28) zum Filtern von Störungen oder Übergangssignalen aus den genannten Spannungssignalen nur dann, wenn diese Spannungssignale die zweite vorbestimmte Spannung überschreiten,

wobei die Überspannungsschutzschaltung dadurch gekennzeichnet ist, daß die zweiten Spannungsstabilisierungsmittel (24, 30; 34 bis 38) einen Übergangsspannungsunterdrücker (24, 30; 34 bis 38) enthalten, der so gewählt ist, daß er eine Durchbruchspannung oberhalb der auf den genannten Leitungen auftretenden Stimm- und Datensignale aufweist, und daß die Filtermittel (14, 22; 16, 28) einen Widerstand (14, 16) und einen Kondensator (22, 28) in Serie zwischen den ersten Spannungsstabilisierungsmitteln (12) und dem Übergangsspannungsunterdrücker (24, 30; 34 bis 38) enthalten.

2. Überspannungsschutzschaltung nach Anspruch 1, worin die ersten Spannungsstabilisierungsmittel (12) bei einer vorbestimmten Spannung oberhalb eines vorbestimmten Wertes eines auf den Leitungen auftretenden Wecksignals stabilisieren.

3. Überspannungsschutzschaltung nach Anspruch 1 oder 2, worin die zweiten Spannungsstabilisierungsmittel (24, 30) ein Paar bidirektioneller Halbleiter-Übergangsspannungsunterdrückungselemente (24, 30) enthalten.

4. Überspannungsschutzschaltung nach Anspruch 1 oder 2, worin die zweiten Spannungsstabilisierungsmittel (34 bis 38) eine Sternschaltung von drei unipolaren Halbleiter-Übergangsspannungsunterdrückungselementen (34 bis 38) enthalten.

5. Überspannungsschutzschaltung nach einem der vorhergehenden Ansprüche, worin die Filtermittel (14, 22; 16, 28) eine Filterung der Spannungssignale oberhalb einer vorbestimmten Frequenz bewirken.

6. Überspannungsschutzschaltung nach Anspruch 5, worin die vorbestimmte Frequenz oberhalb eines vorbestimmten Wecksignalfrequenzbereichs liegt.

7. Überspannungsschutzschaltung nach einem der vorhergehenden Ansprüche, worin die ersten Spannungsstabilisierungsmittel (12) in der Lage sind, einen Strom bei einer ersten Durchbruchspannung zu führen und einen Strom unterhalb der ersten Durchbruchspannung zu blockieren und die zweiten Spannungsstabilisierungsmittel (24, 30; 34 bis 38) in der Lage sind, einen Strom bei einer zweiten Durchbruchspannung zu führen und einen Strom unterhalb der zweiten Durchbruchspannung zu blockieren.

Revendications

1. Circuit de protection contre le surtensions, utilisé avec une paire de lignes téléphoniques ou des canaux similaires de transmission de données et comportant:

des premiers moyens d'écrêtage de tension (12) pour écrêter des signaux de tension sur lesdites lignes à un premier potential de tension prédéterminé;

des seconds moyens d'écrêtage de tension (24, 30; 34 à 38) destinés à écrêter des signaux de tension sur lesdites lignes à un second potentiel de tension prédéterminé; et

des moyens de filtrage (14, 22; 16, 28) réagissant auxdits seconds moyens d'écrêtage de tension (24, 30; 34 à 38) en filtrant les signaux parasites ou transitoires de signaux de tension seulement quand lesdits signaux de tension dépassent ledit second potentiel de tension prédéterminé,

ledit circuit de protection de surtension étant caractérisé en ce que lesdits seconds moyens d'écrêtage de tension (24, 30; 34 à 38) comportent un suppresseur de tension transitoire (24, 30; 34 à 38) choisi de manière à ce que sa tension nominale d'amorçage soit supérieure aux signaux vocaux et de données transportés par lesdites lignes et en ce que lesdits moyens de filtrage (14, 22; 16, 28) comprennent une résistance (14, 16) et un condensateur (22, 28) connectés en série entre lesdits premiers moyens d'écrêtage de tension (12) et ledit suppresseur de tension transitoire (24, 30; 34 à 38).

2. Circuit de protection contre les surtensions selon la revendication 1, dans lequel lesdits premiers moyens d'écrêtage de tension (12) écrêtent à un potentiel de tension prédéterminé supérieur à un potentiel prédéfini d'un signal d'appel transmis par lesdits lignes.

3. Circuit de protection contre les surtensions selon la revendication 1 ou 2, dans lequel lesdits seconds moyens d'écrêtage de tension (24, 30) comprennent une paire de dispositifs suppresseurs de tension transitoire à semi-conducteurs bidirectionels (24, 30).

4. Circuit de protection contre les surtensions selon la revendication 1 ou 2, dans lequel lesdits seconds moyens d'écrêtage de tension (34 à 38) comprennent une disposition en étoile de trois dispositifs suppresseurs de tension transitoire à semi-conducteurs unipolaires (34 à 38).

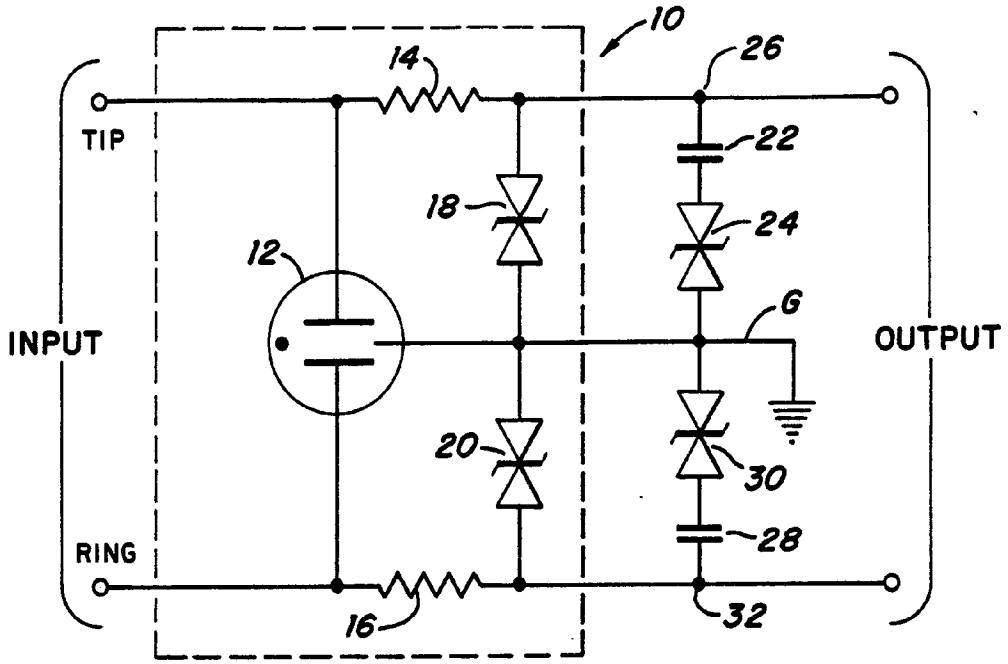
5. Circuit de protection contre les surtensions selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens de filtrage (14, 22; 16, 28) ont pour effet de filtrer lesdits signaux de tension au-dessus d'une fréquence prédéterminée.

6. Circuit de protection contre les surtensions selon la revendication 5, dans lequel ladite fréquence prédéterminée est supérieure à une plage de fréquence de signal d'appel prédéfinie.

7. Circuit de protection contre les surtensions selon l'une quelconque des revendications précédentes, dans lequel lesdits premiers

moyens d'écrêtage de tension (12) sont agencés pour conduire des courants à une première tension d'amorçage et pour bloquer un courant au dessous de ladite première tension d'amorçage et lesdits seconds moyens d'écrêtage de tension (24, 30; 34 à 38) sont agencés pour conduire un courant à une seconde tension d'amorçage et pour bloquer un courant au-dessous de ladite seconde tension d'amorçage.

Fig.1


10
14
26
TIP
22
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INPUT
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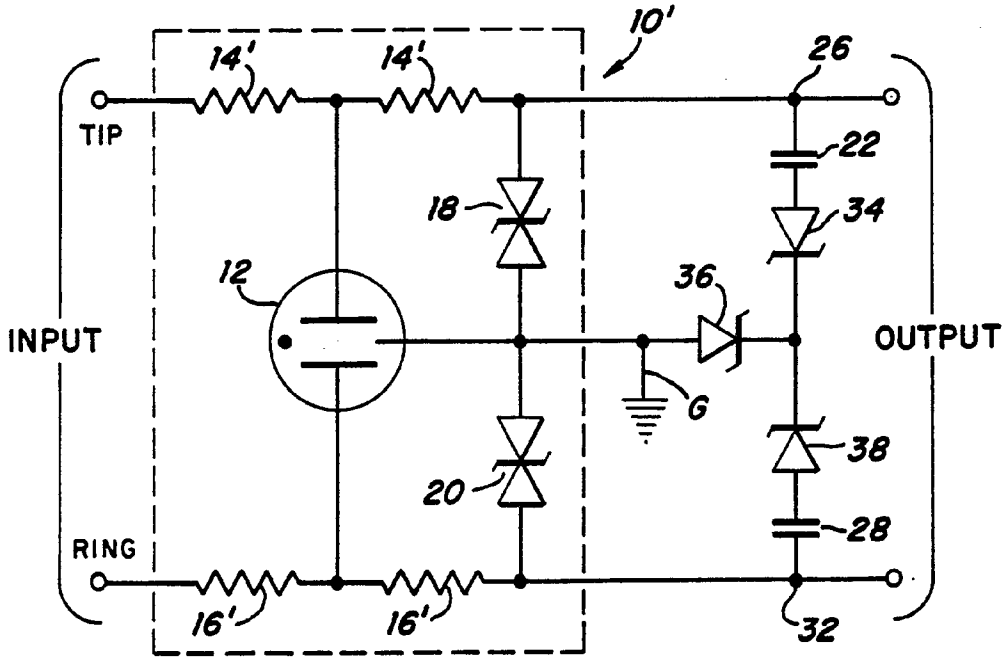
20
30
28
RING
16
32

Fig.2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